First of a Series on

DAYS OF THE DINOSAURS

WHAT IS A DINOSAUR?

by

DOLLA COX WEAVER

Raymond Foundation

Museum Stories, Number 306

October 6, 1956

What Is a Dinosaur?

What is a dinosaur? Would you say that a dinosaur is a gigantic monster that lived long, long ago? Well, that answer isn't exactly correct because the word "monster" is sometimes used for a mythical animal. "Dinosaur" is a popular name for certain reptiles that lived during the Mesozoic era (from 200 million to 75 million years ago). We know that the prehistoric animals called dinosaurs really lived because of the many fossil skeletons that have been found.

Among the dinosaurs were many different-looking animals, and some were not very closely related to one another. For example, the dinosaur Brontosaurus was no more closely related to the dinosaur Stegosaurus than a cow is to a horse. Not all the dinosaurs were giants. The first dinosaurs were very small, some of them no larger than chickens.

The earliest known dinosaur in our country was about eight feet long. He is called Coelophysis (see-lo-FYE-sis) and he lived about 180 million years ago during the last part of the Triassic period (fossil skeletons have been found in northern New Mexico). Most of his eight-foot length was made up by a long, slender tail. He was very lightly built and perhaps weighed no more than fifty pounds. Because of his light build he was probably able to run very fast. His small front legs were equipped with claws that were useful in grasping and tearing food. His teeth were sharp and he probably preyed on small reptiles. He walked on his hind legs.

It is a very important fact that the earliest dinosaurs walked on their hind legs. As the dinosaurs continued to develop, some of them grew larger and heavier and came down on their front legs to support themselves better. Because of this, most of these dinosaurs had an arched back and shorter front legs than hind legs. But there was a dinosaur called Brachiosaurus that is an exception.

Paleontologists, the scientists who study prehistoric animals, have divided the dinosaur family into two large groups. One group is named the "reptile hips" and the other the "bird

hips" because their hip bones resemble in arrangement the hip bones of either reptiles or birds. The reptile-hipped dinosaurs included both plant-eaters and meat-eaters, but the bird-hipped dinosaurs were all plant-eaters.

Some of the reptile-hipped dinosaurs walked on their large muscular hind legs and used their front legs only for grasping. Many of these dinosaurs were very large and weighed eight or more tons, and some were very small. We know that nearly all of them were meat-eaters because they had long, sharp, pointed teeth. The gigantic four-legged forms in the reptile-hipped group, such as Brontosaurus and Brachiosaurus, had very long tails, long necks, and small heads. They had spoon-shaped or peg-like teeth and were plant-eaters.

The "armored" dinosaurs, the "plated" dinosaurs, the "horned" dinosaurs, and the "duck-billed" dinosaurs all belong to the group of bird-hipped dinosaurs. All the bird-hipped dinosaurs were plant-eaters. Some of them walked on four legs, others only on their hind legs. Most of these dinosaurs developed spectacular structures for defense against their enemies, the meat-eating dinosaurs. Some had long, sharp horns. Others had double rows of fan-shaped plates up their backs and spikes on their tails. Others had bony plates over the body, spikes along the sides of the body, and a long club-like tail. And still others had duck-like bills and bony crests or long tubes extending back from the top of their heads.

In what parts of the world did the dinosaurs live? Fossil skeletons of dinosaurs have been found all over the world and on nearly every continent. The largest number of dinosaur skeletons and some of the most interesting kinds have been found right in our own country. The first dinosaur skeleton found in the United States was at Haddonfield, New Jersey, but most of the skeletons have been found in Montana, Wyoming, Colorado, Utah, and New Mexico. At Dinosaur National Monument near Jensen, Utah, you can see parts of dinosaur skeletons sticking out of the rocks. At the time that the dinosaurs were alive, this region looked much different than it does today. The Rocky Mountains did not exist then.

TYRANNOSAURUS
LAMBEOSAURUS
EDMONTOSAURUS
CRETACEOUS
PARASAUROLOPHUS
TRICERATOPS
GORGOSAURUS
PALAEOSCINCUS
PROTOCERATOPS
BRONTOSAURUS
ALLOSAURUS
JURASSIC
DIPLODOCUS
BRACHIOSAURUS
STEGOSAURUS
"BIRD-HIPPED" DINOSAURS
"REPTILE-HIPPED" DINOSAURS
COELOPHYSIS
(an early dinosaur)
TRIASSIC
DINOSAUR
FAMILY TREE

Second of a Series on

DAYS OF THE DINOSAURS

BRONTOSAURUS

by

DOLLA COX WEAVER

Raymond Foundation

Museum Stories, Number 307

October 13, 1956

Brontosaurus

Brontosaurus has been named the "thunder lizard." He probably made an awful racket as he crashed around in marshes, crushing the plants and splashing in the water. Brontosaurus (bront-o-SAWR-us) was one of the giants among the dinosaurs. He weighed around thirty tons and was nearly seventy feet in length. A great amount of this length was due to his very long, whip-like tail and an extremely long neck. His very large and heavy backbone and ribs indicate that he was a very large animal. Some of the ribs of his skeleton are nearly seven feet long and six inches across. His leg bones are almost as thick as telephone poles. He must have needed thick leg bones to support his thirty tons of weight.

His feet were broad and had large pads on them, somewhat like those of elephants today. He had five toes on each foot. There was a large claw on the inner toe of each front foot and on the inner toe of each hind foot.

His head, far out on the end of his very long neck, seems tiny for such a large animal. Inside this small head was an even smaller brain, about the size of a baseball. He was not a "thinking" animal. His large size was a defense against some of the meat-eating dinosaurs, such as Allosaurus.

Brontosaurus spent much of his time in the water, probably to escape from attacks by the meat-eating dinosaurs that lived on land. He may have found it easier to support his tremendous weight when half-floating around in swamps and lakes than when walking on the land.

Remarkable dinosaur footprints have been found in Texas. Some of the footprints of the hind feet are 38 inches long and 26 inches wide. By studying a series of footprints, paleontologists actually know how these dinosaurs waded into the water. Brontosaurus first stood at the edge of the bank and floated his front legs, then gradually he eased his whole body into the water, and then, with a great shove from his hind legs, he floated off. As he gave the final push he left only the impression of the claws of his hind feet.

Brontosaurus was a plant-eater, which can be told from the kind of teeth he had. He used his spoon-shaped teeth to crop off plants, and he probably didn't bother about chewing his food. He probably ate the soft plants that grew in the water. What an enormous amount of plants he had to eat every day to keep going! No doubt he spent his days just eating.

His long neck must have been very useful as he browsed among the water-plants of the swamps and lakes. He was also able to reach out and nibble at leaves of bushes growing along the bank. He used his clawed feet to grub up plants and to help balance his thirty-ton body as he walked in the soft mud of the swamps. His legs and tail were not adapted for swimming as were those of the duck-billed dinosaurs. He probably was a wader rather than a swimmer. He may have spent long hours sunning himself on the banks of lakes.

Our illustrations, except those for stories one and three, are photographs of murals by Charles R. Knight. Chicago Natural History Museum has a large collection of these famous restorations of prehistoric animals. An authority on dinosaurs has said that the Knight murals are "worthy of constant repetition, for no better impressions of some of the former denizens of our land have ever been created."

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BRONTOSAURUS

This page is for your own notes and illustrations

Third of a Series on

DAYS OF THE DINOSAURS

BRACHIOSAURUS, DIPLODOCUS, ALLOSAURUS

by

DOLLA COX WEAVER

Raymond Foundation

Museum Stories, Number 308

October 20, 1956

Brachiosaurus, Diplodocus, Allosaurus

Brontosaurus was a big dinosaur but he wasn't the biggest. The real giant was Brachiosaurus (brak-e-o-SAWR-us), another plant-eater. This dinosaur was eighty feet long (that's twice as long as an ordinary freight car), and he may have weighed more than fifty tons. He had a shorter tail and a thicker and heavier body than Brontosaurus. He had a very long neck and carried his head thirty-four feet above the ground. He could have looked into the second-floor windows of Chicago Natural History Museum if there had been a Museum then! He was the tallest land animal that has ever lived. Unlike most of the other dinosaurs, his front legs were much longer than his hind legs. These longer front legs may indicate that he could have waded out into deeper water than some of the other large dinosaurs did. His back sloped downward to his hind legs, somewhat like a giraffe's does.

His nostrils were above his eyes in a bony knob on the top of his skull. Nostrils in this unusual place indicate that Brachiosaurus could have submerged himself completely except for the top of his head sticking out of the water.

Paleontologists of this Museum were the first to find a skeleton of Brachiosaurus. They were pleased with this unusual find of the biggest dinosaur. But, unfortunately, the skeleton was in poor condition and they were not able to put it on exhibition. In 1914, fourteen years later, German paleontologists found a bigger Brachiosaurus in East Africa.

Diplodocus (dip-LAH-do-cus) was another giant plant-eating dinosaur. One skeleton measures 87½ feet, making Diplodocus the longest dinosaur that is now known. Although he was longer than Brachiosaurus, he was not as heavy or as ponderously built. His teeth were more like pegs than the spoon-shaped ones of Brontosaurus. Diplodocus had nostrils near the top of his skull, and so he was also probably able to submerge in the same submarine fashion as Brachiosaurus. The large plant-eaters such as Brachiosaurus, Brontosaurus, and Diplodocus had very small brains in proportion to their large bodies.

A paleontologist from Chicago Natural History Museum excavates the upper bone of the front leg of Brachiosaurus near Grand Junction, Colorado

Allosaurus (al-lo-SAWR-us) was a ferocious meat-eating dinosaur that lived at the same time as the plant-eating Brachiosaurus and Diplodocus. He was about thirty-four feet long and had a very large skull. His long, sharp teeth curved backward like a snake's teeth. His jaws were hinged in a very unusual manner and so he could bolt large chunks of meat. His hind legs were very heavy and muscular to support his great weight. His front legs, which were much smaller than his hind legs, were equipped with claws that he may have used in eating. He could not walk on all four legs.

Skeletons of Brontosaurus have been found in which parts of the tail bones have been bitten off. Paleontologists have discovered that the teeth of Allosaurus fit exactly into these gnawed places! That is good evidence that Allosaurus fed on Brontosaurus. He may not have actively hunted these large dinosaurs, but he may have fed on carcasses that he found.

Brontosaurus, Brachiosaurus, Diplodocus, and Allosaurus all lived during the Jurassic period—from 175 million to 140 million years ago.

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Fourth of a Series on

DAYS OF THE DINOSAURS

THE MEAT-EATERS

by

DOLLA COX WEAVER

Raymond Foundation

Museum Stories, Number 309

October 27, 1956

The Meat-eaters

About the best known of all the dinosaurs was the "tyrant lizard" Tyrannosaurus (tye-ran-o-SAWR-us), who has been named the "king of the dinosaurs." He was given this name because paleontologists believe that he was probably the most ferocious dinosaur. He measured fifty feet from his head to the tip of his tail. When he stood upright his head was twenty feet above the ground. He must have weighed around eight tons. He was the largest meat-eater that has ever lived on land.

Tyrannosaurus walked on his very heavy and very strong hind legs. He probably used his heavy tail to help balance himself on them. He might also have been able to use his tail as a whip. Think how easily he could have knocked another dinosaur off-balance with one swipe of his big tail!

The terrible claws on his hind legs made good weapons for an aggressive meat-eater. He had three forward-facing claws on his hind legs and, higher up on the back of each leg, another large claw. His front legs were so small that they must have looked ridiculous for an animal of that large size. They were too small and weak to have supported his eight tons of weight, and so they were probably not of much use to him. He could not have walked on all four legs because he would have fallen flat on his face before his short front legs could touch the ground. If he had tried to use his front legs as hands and arms to feed himself, he probably would have found that they were too short to reach his mouth.

Tyrannosaurus had a very large head with big, strong jaws. He could have opened his mouth very wide to take large bites. He probably fed by bending over his victim and tearing off large chunks of flesh with his long, pointed teeth. Some of his dagger-like teeth were six inches long. Can you imagine teeth that were half a foot in length?

Another meat-eater was Gorgosaurus (gor-go-SAWR-us), whose name means "terrible lizard." Gorgosaurus was not as large as Tyrannosaurus, but the two dinosaurs were closely related and lived during the same period. Gorgosaurus was

about thirty feet long and, when he stood upright, about fifteen feet tall. He may have weighed as much as six tons (African elephants of today weigh from six to seven tons).

Gorgosaurus also had very short front legs that were probably not of much use to him in feeding. Like his larger "cousin" Tryannosaurus, he also walked on his hind legs. One paleontologist has suggested that Gorgosaurus crouched down on his tremendous hind legs when he fed. It has also been suggested that when Gorgosaurus slept he might have laid flat on his stomach with his tail stretching out behind him.

These meat-eating kinds of dinosaurs were more streamlined and therefore had more speed than some of the other dinosaurs. Because they walked on their hind legs, they probably could run much faster than the heavy dinosaurs that walked on all four legs. The ability to run fast or to move quickly is needed by meat-eating animals. Animals that hunt need also heavy, powerful jaws and long, sharp teeth.

Fossil skeletons of Tyrannosaurus and Gorgosaurus are not found as often as the skeletons of some of the other dinosaurs. The skeleton of Gorgosaurus on exhibition in this Museum is one of the seven skeletons of Gorgosaurus that are known.

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TYRANNOSAURUS

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Fifth of a Series on

DAYS OF THE DINOSAURS

PLATED AND ARMORED DINOSAURS

by

DOLLA COX WEAVER

Raymond Foundation

Museum Stories, Number 310

November 3, 1956

Plated and Armored Dinosaurs

Some of the plant-eating dinosaurs developed unusual structures, or plates, to help protect them against the terrible teeth and sharp claws of the meat-eaters.

One of the most interesting of the plated dinosaurs was Stegosaurus, whose name means the "covered lizard." Stegosaurus (steg-o-SAWR-us) was more than twenty feet long and weighed around six or seven tons. His legs certainly look as if they didn't match very well. The hind ones were very long and straight, while the front ones were short and extended out from his body and then down. These legs probably made Stegosaurus very slow-moving and clumsy, and he may have swayed from side to side as he walked.

Down his back was a double row of triangular bony plates, and the end of his tail was armed with four huge spikes. The largest plates, above his hind legs, were three feet high. These plates probably helped to protect him against ferocious Allosaurus. Stegosaurus may have swung his spike-tipped tail back and forth like a club to ward off attacks.

Inside his long, narrow, flattened skull was a brain about the size of a walnut. Just think of that! A reptile the size of an elephant with a brain the size of a kitten's! The nerve

PALAEOSCINCUS © C.N.H.M.

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STEGOSAURUS

cord running down his back became very large, about twenty times the size of his brain, just over his hind legs. This nerve center is mistakenly called a "brain" in an often-quoted verse by a newspaper columnist, but this nerve center wasn't a true brain. It was a kind of message center to relay messages from the brain. Stegosaurus wasn't a "smart" animal; in fact he wasn't even a "smart" dinosaur.

Millions of years later an armored dinosaur developed, and he was truly a reptilian "tank." Palaeoscincus was his name (pale-e-o-SKINK-us). He looked much different from the other dinosaurs. His legs were short and his body was only a few inches off the ground. His flat back was covered with large bony plates and along each side, from head to tail, was a row of sharp spikes. His tail was a heavy club ending in a large knob of bone. What a good weapon that tail must have been! If Tyrannosaurus attacked, Palaeoscincus could have pulled his legs underneath him and started swinging his tail.

Stegosaurus and Palaeoscincus did not live at the same time. Stegosaurus lived during the Jurassic period (175 million to 140 million years ago) and Palaeoscincus during the Cretaceous period (140 million to 75 million years ago).

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Sixth of a Series on

DAYS OF THE DINOSAURS

THE HORNED DINOSAURS

by

DOLLA COX WEAVER

Raymond Foundation

Museum Stories, Number 311

November 10, 1956

The Horned Dinosaurs

The first of the horned dinosaurs was little Protoceratops (prot-o-SER-at-ops). Even though his name means the "first horned face" he didn't have any horns. Much later, relatives of Protoceratops developed horns on their faces. Protoceratops had a curved horny beak, which was probably used in biting off the stems of plants. A bony frill extended backward over his neck, and the lower jaw muscles were attached to this frill. Protoceratops was about five or six feet long. He walked on four legs, and he had a long, slender tail that was flattened at the sides.

For a long time paleontologists had suspected that dinosaurs laid eggs. This idea was based on the fact that most reptiles of today lay eggs. But the paleontologists had never been able to find any fossil dinosaur-eggs.

Then quite unexpectedly an expedition in 1928 found several nests of dinosaur eggs in the Gobi Desert and, near the nests, a number of skeletons of Protoceratops. Back in the United States, museum scientists sawed open two of these eggs with a special saw and inside they found the tiny skeletons of Protoceratops. These fossil eggs had a pebbly surface and were from four to five inches long. One end was larger than the other, somewhat like the lizard eggs of today. So it has been proved that at least one kind of dinosaur did lay eggs. Probably all dinosaurs were egg-layers.

PROTOCERATOPS AND EGGS © C.N.H.M.

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TRICERATOPS

Triceratops (try-SER-at-ops), another of the horned dinosaurs, was much larger than little Protoceratops. He was about twenty feet long and stood eight feet high. He may have weighed as much as six or seven tons. His head was protected by a tremendously large bony frill that extended back over his neck and shoulders. He also had a curved beak and, as his name tells us, three horns. Two of the horns were very long and sharp, but the one over his nose was much smaller. These horns must have been powerful weapons that he used in fights with Tyrannosaurus. Triceratops was probably able to lower his head and make running thrusts with his horns.

The horned dinosaurs may have used their horns in battles with one another for mates as well as for protection from the meat-eating dinosaurs. The arrangement and number of horns varied greatly among the horned dinosaurs. Monoclonius had a single great horn on his nose and a very small horn above each eye, but Styracosaurus had a large horn on his nose and spikes all around the outer edge of his neck frill. We know that all the horned dinosaurs were plant-eaters.

Protoceratops and Triceratops did not live at the same time. Protoceratops was the first of the horned dinosaurs, and millions and millions of years later Triceratops, the last of the great horned dinosaurs, developed.

This page is for your own notes and illustrations

Seventh of a Series on

DAYS OF THE DINOSAURS

THE DUCK-BILLED DINOSAURS

by

DOLLA COX WEAVER

Raymond Foundation

CHICAGO NATURAL HISTORY MUSEUM
RESEARCH AND EDUCATION
FOUNDED 1893 BY MARSHALL FIELD

Museum Stories, Number 312

November 17, 1956

The Duck-billed Dinosaurs

The several kinds of dinosaurs that have been given the name "duck-billed" dinosaurs were the true swimmers. They had some unusual physical structures that were very useful for their life in the water.

Lambeosaurus (lamb-e-o-SAWR-us) had a long head and jaws that ended in a duck-like bill. He didn't have teeth in the front of his mouth, but on each side of his jaws were several rows of closely packed teeth. These teeth were somewhat like chisels fitted together tightly. Beneath these rows of teeth were other teeth already formed and ready to push up to replace each tooth as it wore down. He probably had as many as two thousand teeth during his life.

Lambeosaurus had a hatchet-shaped bony extension from the top of his head. And still another duck-billed dinosaur called Parasaurolophus (par-a-sawr-AH-lof-us) had a long tube-like projection extending backward from his head. This projection may have been used as an air-storage chamber. When the duck-billed dinosaurs fed, they may have submerged in the water and used this reserve air-supply.

The bodies of the different kinds of duck-billed dinosaurs were very similar in shape. Paleontologists find it difficult to tell the skeletons of different kinds apart until they have studied the skulls. The duck-billed dinosaurs developed many kinds of crests on their heads. These dinosaurs are best identified by studying their crests.

Paleontologists have a very good idea of how the skin of the duck-billed dinosaurs must have looked. An impression of the skin of the dinosaur Edmontosaurus (ed-MONT-o-sawr-us) has been found. It shows that the skin was tough and leathery, with hundreds of horny scales covering it. An impression of the webbing between the toes of the front feet has also been found. Paleontologists therefore think that all duck-billed dinosaurs probably had this webbing, which was useful in paddling. These dinosaurs had the kind of tail that is useful in swimming—high and flattened at the sides.

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EDMONTOSAURUS

Some of the duck-billed dinosaurs walked on their hind legs most of the time, but nevertheless they were able to bend over and put their front feet on the ground. They probably made quick dashes to the water to escape from the land-living dinosaurs, such as the fierce Tyrannosaurus. The duck-billed dinosaurs were all plant-eaters and fed on the plants growing on the banks of the rivers and lakes where they lived. Perhaps they used their duck-like bills to bite off the plants that grew in the shallow water.

Fossil skeletons of plant-eating dinosaurs are relatively common in many parts of the world. In certain areas of the western United States so many skeletons of duck-billed dinosaurs have been found that we can assume that these dinosaurs lived there in herds. But the fossil skeletons of meat-eating dinosaurs are more rare. This scarcity may indicate that there were fewer of this kind of dinosaur. Today this relationship of plant-eaters to meat-eaters can be observed among animals that live in the same community. The predators are always fewer in number than the animals they prey upon.

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Eighth of a Series on

DAYS OF THE DINOSAURS

WHY ARE THERE NO DINOSAURS TODAY?

by

DOLLA COX WEAVER

Raymond Foundation

Museum Stories, Number 313

November 24, 1956

Why Are There No Dinosaurs Today?

Why did the dinosaurs die out?

You may have heard in movies or read in comics some ridiculous reasons for the disappearance of dinosaurs. You might have read that during the Ice Age great sheets of ice moved down and killed them off. Well, it is true that there was an Ice Age. But scientists are certain that it started about a million years ago. And the last of the dinosaurs died out about 75 million years ago. So that means that the dinosaurs had been extinct at least 74 million years before the great ice-sheets started slowly moving down out of the North.

Perhaps the cave men killed all the dinosaurs, as a certain movie suggested. No, absolutely no! Just remember that millions and millions of years before the first prehistoric people lived, the last of the dinosaurs had vanished from the earth, and only fossil skeletons and tracks are left to record the fact that there were dinosaurs.

No one truly knows why the dinosaurs died out, but paleontologists have developed some theories that we should know about. Now let us examine some of these explanations. One paleontologist thinks that diseases could have wiped out all the dinosaurs. Other paleontologists disagree with him and say that they don't believe that diseases would have killed every dinosaur in every part of the world.

Another suggestion is that the early mammals that were developing at that time could have fed on dinosaur eggs. If the early mammals had eaten all the dinosaur eggs, then there would have been no new little dinosaurs to hatch. Although we know that Protoceratops laid eggs, we can't be certain that all the dinosaurs did lay eggs. Not all the reptiles living today are egg-layers. Another weakness of this theory is the assumption that all the early mammals ate eggs.

Most paleontologists are able to agree that change in climate is an important clue to the disappearance of the dinosaurs. When dinosaurs lived, the landscape looked quite different than it does today. There were many lakes and

swamps with mosses, ferns, and water plants. Great subtropical forests flourished, and palm trees grew in Colorado and Wyoming. The climate was more nearly uniform all over the world than it is now—there were not the hot summers and cold winters of today. Then very slowly the continents were raised, the swamps and lakes were drained, and mountains were pushed up in many parts of the northern hemisphere.

With these changes in the climate and in the land came changes in the kinds of vegetation. Evidently the dinosaurs were not able to accustom themselves to all these changes in their surroundings and gradually began to die off. Probably the stegosaurs were the first of the dinosaurs to become extinct. Then gradually the giant plant-eating dinosaurs, the meat-eating dinosaurs, the duck-billed dinosaurs, the armored dinosaurs, and the horned dinosaurs followed into extinction. As the plant-eaters gradually became fewer and fewer, the meat-eaters must have also diminished in number because their source of food, the plant-eaters, had become scarce. The meat-eating dinosaurs may have helped to hasten their own extinction by becoming dinosaur-cannibals.

Paleontologists believe that the dinosaurs became extinct as the result of several causes. A diminished food-supply and the inability to become adapted to a changing world were among the important factors. With the dinosaurs disappearing, the small active mammals began to dominate the scene. But we must not get the idea that the dinosaurs died off within a few years. Paleontologists tell us that the "time of the great dying" lasted for millions and millions of years.

As the days of the dinosaurs dimmed, many other animals became extinct. Some of these were the flying reptiles (pterosaurs), among which one giant had a wing-spread of twenty-five feet; the swimming reptiles (ichthyosaurs), which were ten or more feet long and looked much like the porpoises of today; the marine lizards (mosasaurs), thirty or more feet long; the swimming reptiles (plesiosaurs), with incredibly long necks; the large marine turtles (protostegids); and, among the invertebrates, the shelled mollusks (ammonites).

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